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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Double Award (Modular)

Forces and Energy

End of Module Test

Higher Tier

C

[GDC02]

GDC02

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.15 am

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total Marks	

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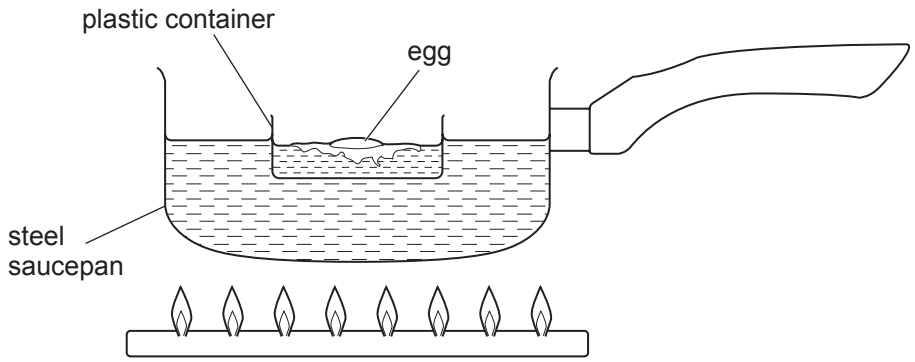
Marks	Remark

1 Jamie poaches an egg by setting it in a plastic container which floats in a saucepan of hot water. The saucepan is made of steel and sits on a gas cooker.



(a) (i) What is the method of heat transfer through the bottom of the steel saucepan?

_____ [1]

(ii) What is the particle mainly responsible for this process?

_____ [1]

(b) (i) What is the method of heat transfer through the plastic container?

_____ [1]

(ii) What is the particle responsible for this process?

_____ [1]

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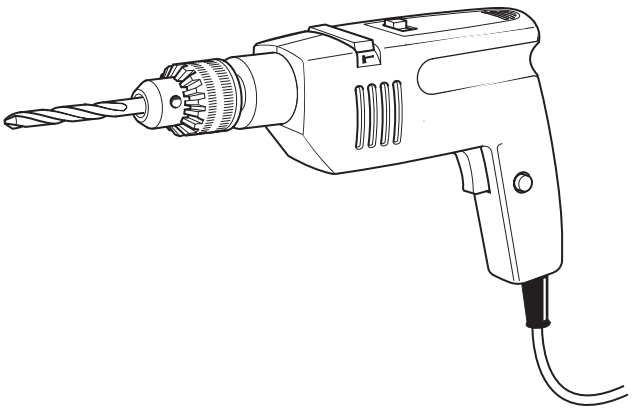
2 Patricia uses an electric drill to drill a hole.



Choose the appropriate data to calculate the efficiency of the drill.

75 J of heat energy were produced.
200 J of electrical energy were used.
80 J of kinetic energy were produced in the drill bit.
45 J of sound energy were produced.

You are advised to show your working out.

Efficiency = _____ [3]

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Marks	Remark

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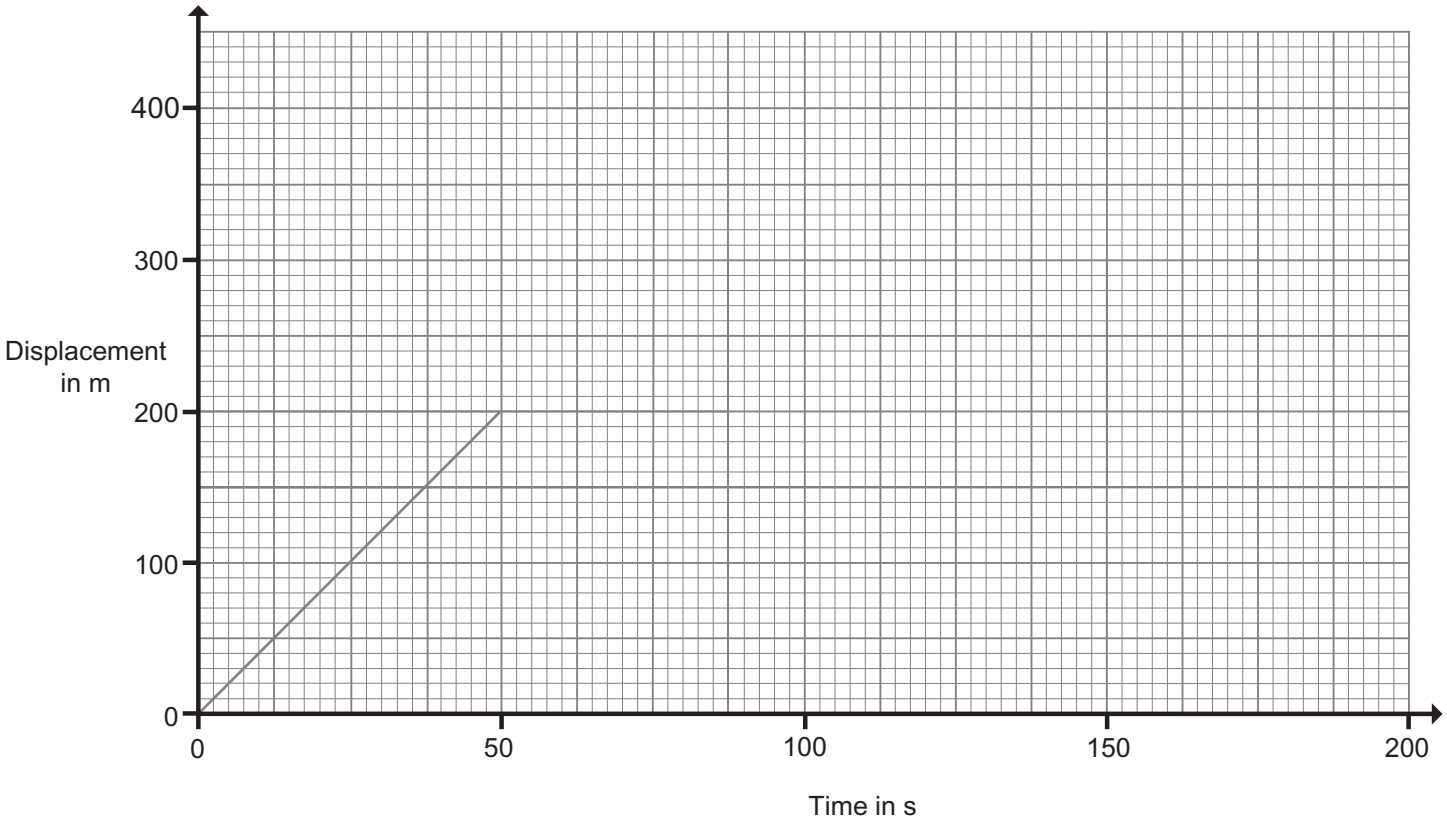
3 A cyclist travels a distance of 200 m in 50 seconds. This is shown in the displacement–time graph below.



The cyclist then rests for 50 seconds before returning to his starting point at a steady speed in a further 100 seconds.

(i) Complete the displacement–time graph for the journey. [2]

(ii) What is the total distance travelled by the cyclist in 200 seconds?

Total distance = _____ m [1]

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Marks	Remark

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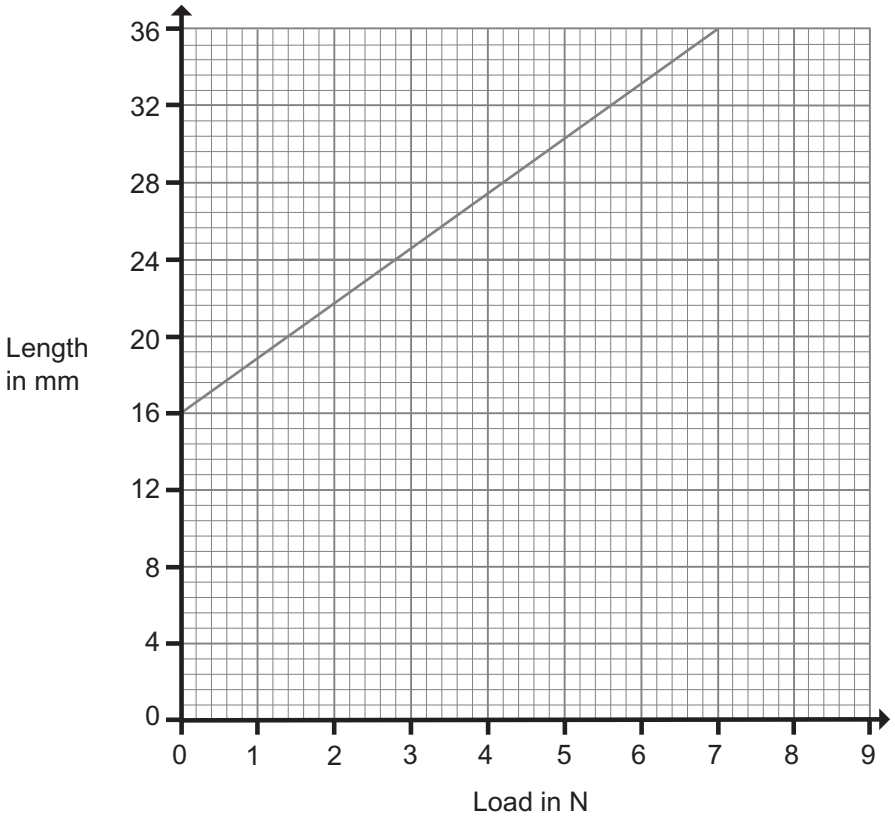
4 Phyllis carries out a Hooke's Law investigation using a spiral spring.

She plots her results on a graph as shown.



(a) What is the unstretched length of the spring?

Unstretched length = _____ mm [1]

(b) How can you tell, from the graph, that the spring has not been stretched beyond its elastic limit?

_____ [1]

(c) **(i)** Phyllis could have investigated Hooke's Law by plotting a more suitable graph. What should she have plotted on the vertical y-axis?

_____ [1]

(ii) An unknown load is hung on the spring and the extension produced is 20 mm.
What is the unknown load?

You are advised to show your working out.

Load = _____ N [2]

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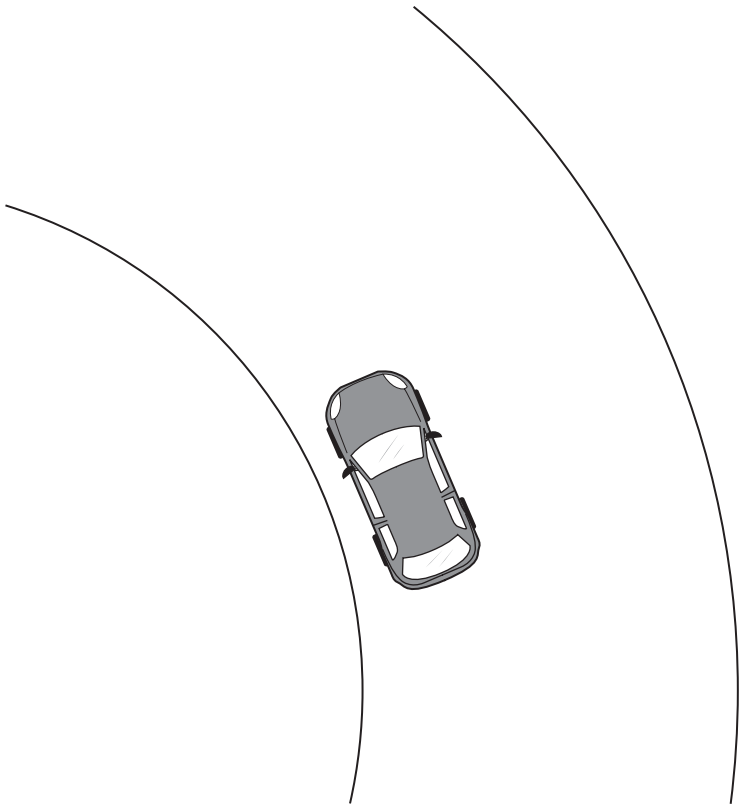
5 The diagram shows a bird's eye view of a car of mass 2000 kg going round a circular track at a constant speed of 7 m/s.



(a) Calculate the momentum of the car.

You are advised to show your working out.

Momentum = _____ kgm/s [3]

In order to move in a curve around the corner a force, called a centripetal force, must act on the car.

(b) What supplies the centripetal force in this case?

Centripetal force supplied by _____ [1]

(c) In what direction does this force act?

_____ [1]

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6 A weightlifter raises a set of weights into the air.

The weight at each end of the bar is 200 N and the bar weighs 100 N.

(a) What is the **total** weight lifted by the weightlifter?

Total weight = _____ N [1]

The weightlifter raises the total weight through a distance of 2 m into the air in a time of 1.5 seconds.

(b) Calculate the power developed by the weightlifter.
Remember to include the unit.

You are advised to show your working out.

Power = _____ [5]

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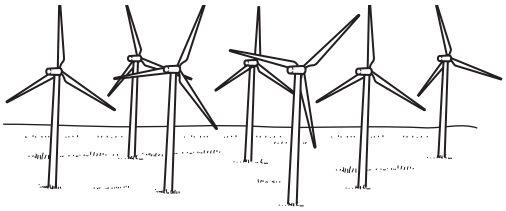
7 The picture shows a wind farm using several wind generators to produce electricity.



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Marks	Remark

(a) What energy change is a wind generator designed to bring about?

_____ [1]

(b) **(i)** State one disadvantage of using wind power to generate electricity.

_____ [1]

(ii) State one advantage of using wind power to generate electricity.

_____

_____ [1]

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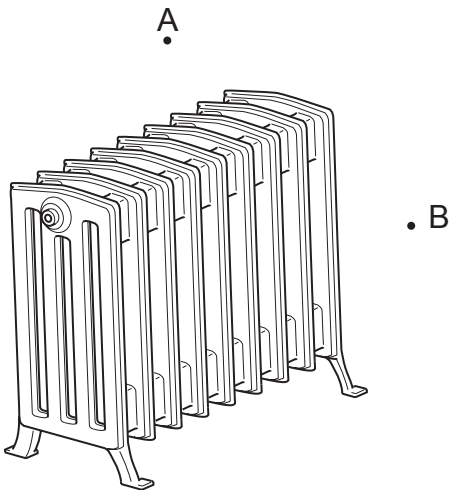
8 The diagram shows a steel radiator containing hot water.



Point A is vertically above the radiator whereas point B is to the side of the radiator. A and B are the same distance from the radiator.

Explain fully why the temperature at A is higher than the temperature at B.

_____

_____ [2]

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Marks	Remark

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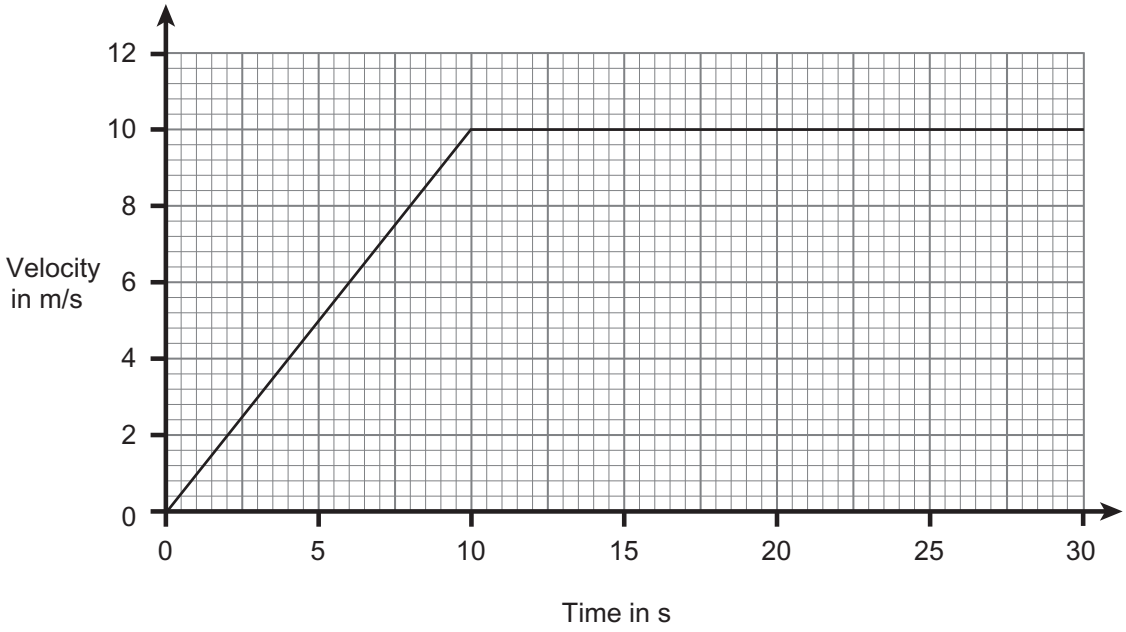
9 The velocity-time graph for a car moving off from traffic lights is shown below.



How far did the car travel in the 30 seconds of its journey?

You are advised to show your working out.

Distance = _____ m [4]

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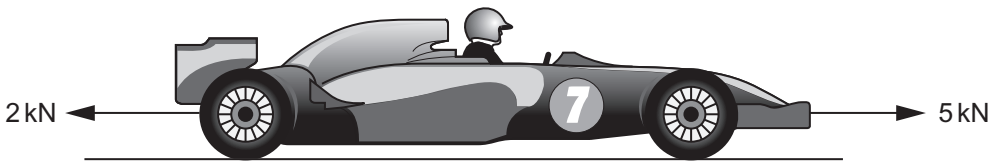
10 The forces acting on a racing car are as shown in the diagram.



(a) Explain why the racing car is accelerating.

_____

_____ [1]

(b) The mass of the racing car is 750 kg.

Calculate the acceleration of the racing car.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

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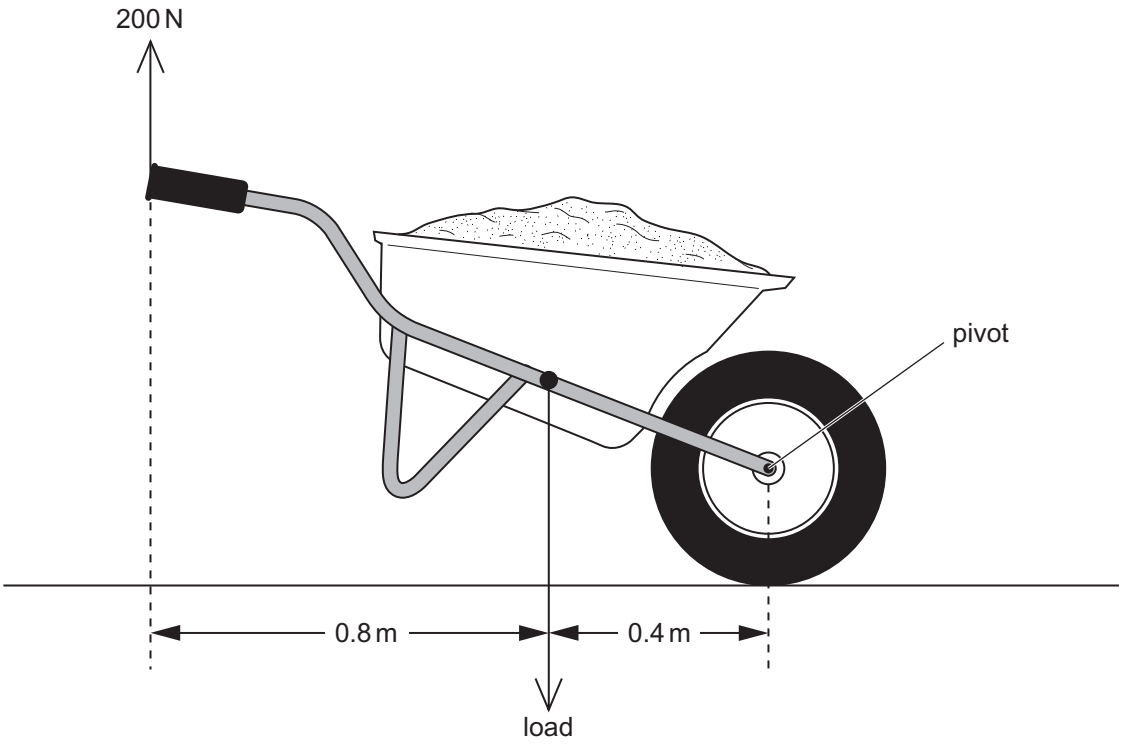
11 A gardener is moving sand in a wheelbarrow.



The gardener exerts a force of 200 N at the ends of the handles of the wheelbarrow, as shown, so that he can just lift the wheelbarrow.

(a) What is the moment about the pivot in Nm that the gardener can produce with this 200 N force?

You are advised to show your working out.

Moment = _____ Nm [2]

(b) Use the Principle of Moments to calculate the maximum load the gardener can lift in the wheelbarrow.

You are advised to show your working out.

Maximum load = _____ N [3]

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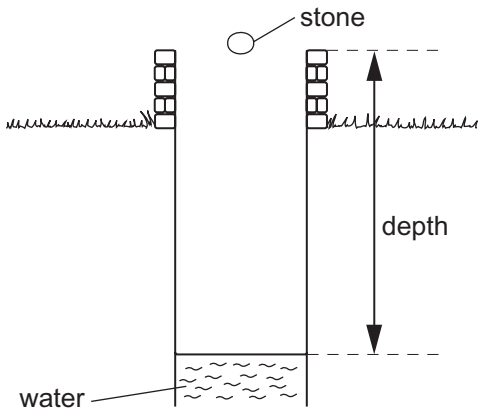
12 A stone of mass 1.5 kg is dropped from rest down a well. The stone hits the water with a speed of 40 m/s.



(a) Calculate the kinetic energy of the stone as it hits the water.

You are advised to show your working out.

Kinetic energy = _____ J [3]

(b) Use the Principle of Conservation of Energy to calculate the depth of the well.

You are advised to show your working out.

Depth = _____ m [3]

THIS IS THE END OF THE QUESTION PAPER

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